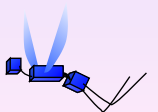


PLEURAL EFFUSION

DR BASSAM FUAD ELSELWI



DEFENITION

- The accumulation of serous fluid within the pleural space is termed pleural effusion.
- it indicates an imbalance between pleural fluid formation and removal. Accumulation of pleural fluid is not a specific disease, but rather a reflection of underlying pathology. Pleural effusions accompany a wide variety of disorders of the lung, pleura, and systemic disorders. Therefore, a patient with pleural effusion may present not only to a pulmonologist but to a general internist, rheumatologist, gastroenterologist, nephrologist, or surgeon

Pathogenesis

- In general, pleural fluid accumulates as a result of either increased hydrostatic pressure or decreased osmotic pressure ('transudative') effusion, as seen in cardiac, liver or renal failure), or from increased microvascular pressure due to disease of the pleura or injury in the adjacent lung ('exudative' effusion)

Causes of pleural effusion

- With knowledge of the pleural fluid cytology, biochemistry, and clinical presentation, an etiological diagnosis can be established in approximately 75% of patients.
- In up to 20% of cases, the cause remains unknown despite a diagnostic workup.

Causes of pleural effusion

Common causes

- Pneumonia ('para-pneumonic effusion')
- Tuberculosis
- Pulmonary infarction*
- Malignant disease
- Cardiac failure*
- Subdiaphragmatic disorders (subphrenic abscess, pancreatitis etc.)

Uncommon causes

- Hypoproteinaemia* (nephrotic syndrome, liver failure, malnutrition)
- Connective tissue diseases* (particularly systemic lupus erythematosus (SLE) and rheumatoid arthritis)
- Post-myocardial infarction syndrome
- Acute rheumatic fever
- Meigs' syndrome (ovarian tumour plus pleural effusion)
- Myxoedema*
- Uraemia*
- Asbestos-related benign pleural effusion

*May cause bilateral effusions.

Transudate

CCF
Cirrhosis
Ascites
Nephrotic
Syndrome
Urinothorax
Peritoneal dialysis

Exudate

Simple exudates

Infectious
TB
Bacterial
Viral
Parasitic
Malignancy
Primary
Metastatic
Connective tissue disorders
RA
SLE
Immunological
PCIS
Sarcoidosis
Wegener's granulomatosis
Gastrointestinal
Related
Complicated AAL
Hepatitis-related
Esophageal perforation
Spleen-related
Abscess
Infarction
Hematoma
Pancreatitis
Other inflammatory
Pulmonary embolism
Asbestos-related
Uremia
Post partum
Post abdominal surgery
Trapped lung
Meig's syndrome
Iatrogenic
Radiation
Esophageal sclerotherapy
Enteral feeding tube misplacement
Drug-induced, eg, nitrofurantoin, amiodarone

Pyothorax

Bacterial
TB
Amebic
Fungal

Hemothorax

Trauma
Surgery
Bleeding
Disorders

Chylothorax

Surgery
Malignancy
Idiopathic
Congenital
Filariasis
Associated
with LAM
Traumatic

Diagnosis

- Through history , examination and investigations
- History
- Effusion symptoms
- Possible symptoms include pleuritic chest pain, dyspnea, and a dry, nonproductive cough
- Pleuritic chest pain may be localized or referred. The pain is usually sharp and is exacerbated by movement of the pleural surfaces, as with deep inspiration, coughing, and sneezing

Diagnosis

- History provides information about the possible etiology
- A history of pneumonia suggests parapneumonic effusion, either complicated (empyema or empyema-like) or uncomplicated.
- Fever indicates an infective etiology
- A history of cardiac, renal, or liver impairment can suggest transudative effusion. Older age, weight loss, and a history of smoking point towards a diagnosis of malignant pleural effusion. Recent leg swelling or deep vein thrombosis may result in an effusion related to pulmonary embolism. Trauma may result in hemothorax or chylothorax.

Diagnosis

- Previous exposure to asbestos may be the cause of benign or malignant effusion related to mesothelioma. Recent esophageal procedures or history of alcohol binging suggest pleural effusion related to esophageal rupture. Ascites may indicate cirrhosis, ovarian cancer, or Meigs syndrome. Postcardiac injury syndrome should be considered in cases of fever, dyspnea, and pleuritic chest pain up to 3 weeks following cardiac surgery. Unilateral leg swelling can strongly indicate pulmonary embolism, and bilateral leg swelling is associated with transudates, such as those caused by heart or liver failure..

Diagnosis

- . History and findings suggestive of connective tissue disease, and certain long-term medications, including amiodarone,⁵ methotrexate, phenytoin, nitrofurantoin, and isoniazid,⁶ suggests that as a possible etiology

Physical examination

- Signs of pleural effusion
- Inspection :elevation of ipsilateral part
- Palpation shifting of trachea to other side if huge

And decrease tactile fremitus

Expansion : decrease in ipsilateral part

Percussion :stony dullness in ipsilateral

Auscultation:decrease air entry to absent air entry

- Signs of etiology or systemic disease

Imaging studies

- Chest X-ray
- Standard posteroanterior and lateral chest radiography remains the most important technique for initial diagnosis of pleural effusion. The amount of fluid to be evident on a posteroanterior film is 200 mL, 50 ml in lateral view
- Classically, a homogenous opacity is seen with obliteration of the costophrenic angle and a curved upper border.
- Pleural fluid localised within an oblique fissure may produce a rounded opacity that may be mistaken for a tumour.



Imaging studies

- **Ultrasonography thorax**
- Ultrasound is more accurate than plain chest X-ray for determining the presence of fluid.
- A clear hypoechoic space is consistent with a transudate and the presence of moving, floating densities suggests an exudate.
- The presence of septation most likely indicates an evolving empyema or resolving haemothorax.
- **Chest CT scan**
- CT scanning is indicated where malignant disease is suspected.

Thoracocentesis and cytobiochemical fluid analysis

- Thoracocentesis should be performed in all patients with more than a minimal pleural effusion (ie, larger than 1 cm in height on lateral decubitus radiography, ultrasonography, or CT) of unknown origin. Aspiration should not be performed for bilateral effusions in a clinical setting strongly suggestive of a pleural transudate, unless there are atypical features or the patient fails to respond to therapy.
- Diagnostic pleural tap with biochemical, cytological, and microbiological examination of the fluid is needed for correct diagnosis

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Thoracocentesis and cytobiochemical fluid analysis

- Simple aspiration provides information on the colour and texture of fluid and these alone may immediately suggest an empyema or chylothorax.
- The presence of blood is consistent with pulmonary infarction, TB , or malignancy but may result from a traumatic tap.
- The routine pleural fluid evaluation usually includes determination of protein, pH, lactate dehydrogenase, glucose, and albumin levels, with adenosine deaminase levels and cell count for differential and cytological examination

Thoracocentesis and cytobiochemical fluid analysis

- Biochemical analysis allows classification into transudate and exudate.
- Characterization of pleural fluid as an exudate or transudate is an important step in pleural fluid analysis.
- Differentiation between transudate and exudate is crucial before further tests are undertaken. A percutaneous pleural biopsy may be necessary in a case of exudative effusion for definitive diagnosis.
- Light's criteria are the most sensitive for identifying exudates, with 98% sensitivity

Light's criteria for distinguishing pleural transudate from exudate

Exudate is likely if one or more of the following criteria are met:

- Pleural fluid protein : serum protein ratio > 0.5
- Pleural fluid LDH : serum LDH ratio > 0.6
- Pleural fluid LDH $>$ two-thirds of the upper limit of normal serum LDH

(LDH = lactate dehydrogenase)

Thoracocentesis and cytobiochemical fluid analysis

- If the clinical appearance suggests a transudative effusion, but the pleural fluid is an exudate according to Light's criteria, the difference between albumin levels in serum and in pleural fluid should be measured. Almost all patients with a serum albumin level .1.2 g/dL higher than the pleural fluid albumin level have a transudative effusion
- For example, in patients with congestive cardiac failure, with diuretics.

Diagnosis	Criteria
Tuberculosis	Exudate, lymphocytic predominance, positive acid-fast bacillus smear or cultures, ADA > 50 U/L
Empyema	Exudative with PMN predominance/pus, positive Gram stains or cultures, LDH > 1000, glucose < 40 mg%, pH < 7.2
Malignancy	Exudate, lymphocytic predominance, positive cytology
Hemothorax	Hemorrhagic, hematocrit > 50% of blood
Esophageal rupture	pH < 7, high salivary amylase
Urinothorax	pH < 7, transudate, pleural fluid-to-serum creatinine ratio > 1
Chylothorax	Triglycerides > 110 mg/dL, chylomicrons, cholesterol/triglyceride ratio < 1
Rheumatoid pleurisy	Exudate, lymphocytic predominance, rheumatoid factor positive > 1:320, low glucose < 40 mg%, ADA > 50 U/L
Lupus pleuritis	Exudate with PMN predominance, LE cells positive, ANA positive > 1:160
Pancreatitis	Exudate with PMN predominance, plenty of RBC Acute: increased serum and pleural amylase Chronic: increased pleural fluid amylase, serum amylase normal
Fungal infection	Black-colored, fungal smear, culture positive

Abbreviations: ADA, adenosine deaminase; ANA, antinuclear antibody; LDH, lactate dehydrogenase; LE, lupus erythematosus; PMN, polymorphonucleocytes; RBC, red blood cells.

Investigations

- Other investigations from fluid
- Gram stain
- Triglycerides
- Amylase level
- ADA(adenosine deaminase for pleural TB)
- RF
- ANA
- PH
- Cytology

Investigations

- Ultrasound- or CT-guided pleural biopsy
- It provides tissue for pathological and microbiological analysis.
- Where necessary, video-assisted thoracoscopy allows visualisation of the pleura and direct guidance of a biopsy.
- Mantoux test

Investigations

- (the pleural fluid LDH level >1000 /U/L., what would that suggest?)
- Empyema
- Malignant effusion
- Rheumatoid effusion
- Pleural paragonimiasis

Investigations

- What are the causes of a chylothorax?
- Lymphatic obstruction (lymphoma or solid tumours)
- Lymphatic damage (post cardiothoracic surgery)
- Nephrotic syndrome
- Liver cirrhosis
- What are the causes of low glucose concentration in pleural fluid?
- Malignancy Empyema ,Tuberculosis;;
- ()esophageal rupture
- Rheumatoid arthritis
- SLE

Management

- Treatment of the underlying cause – e.g. heart failure, pneumonia, pulmonary embolism or subphrenic abscess – will often be followed by resolution of the effusion
- Therapeutic aspiration may be required to palliate breathlessness
- but removing more than 1.5 L at a time is associated with a small risk of re-expansion pulmonary oedema

Empyema

Definition and etiology

- This is a collection of pus in the pleural space, which may be as thin as serous fluid or so thick that it is impossible to aspirate, even through a wide-bore needle.
- It is always secondary to infection in a neighbouring structure, usually the lung, most commonly due to the bacterial pneumonias and tuberculosis.
- Over 40% of patients with community-acquired pneumonia develop an associated pleural effusion ('parapneumonic' effusion) and about 15% of these become secondarily infected. Other causes are infection of a haemothorax following trauma or surgery, oesophageal rupture, and rupture of a subphrenic abscess through the diaphragm.

Complications

- Bronchopleural fistula
- Pyopneumothorax,
- Track through the chest wall with the formation of a subcutaneous abscess or sinus, so-called empyema necessitans.
- Sepsis

Clinical assessment

- An empyema should be suspected in patients with pulmonary infection if there is severe pleuritic chest pain or persisting or recurrent pyrexia, despite appropriate antibiotic

Systemic features

- Pyrexia, usually high and remittent
- Rigors, sweating, malaise and weight loss
- Polymorphonuclear leucocytosis, high CRP

Local features

- Pleural pain; breathlessness; cough and sputum, usually because of underlying lung disease; copious purulent sputum if empyema ruptures into a bronchus (bronchopleural fistula)
- Clinical signs of pleural effusion

Radiology

- **X ray** may indistinguishable from those of pleural effusion, 'D'-shaped shadow due to pleural adhesions may When air is present as well as pus (pyopneumothorax), a horizontal 'fluid level' marks the air/liquid interface

. **Ultrasound**

shows the position of the fluid, the extent of pleural thickening and whether fluid is in a single collection or multiloculated, containing fibrin and debris, guides aspiration

CT scan

provides information on the pleura, underlying lung parenchyma and patency of the major bronchi, guides aspiration

INVESTIGATIONS

- Pleural fluid analysis
- features suggesting empyema are:
 - A fluid glucose of less than 3.3 mmol/L (60 mg/dL),
 - lactate dehydrogenase (LDH) of more than 1000 IU/L,
 - A fluid pH of less than 7.0 ($H^+ > 100$ nmol/L).
- OTHER
pleural biopsy, histology, culture and/or a NAAT.

Management

- Early chest drain or tube
- Antibiotics
- Surgery

Thank you